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given values of a, b, and c, $y^4-228y^3+4864y^2+1620624y-70941200=0$.

Whence $y=50$ and $x=40$.

$$DT=\sqrt{(24^2+50^2-2\times50\times24\times.6)}=\sqrt{1636}-40.4474 \text{ rds.}$$

$$\text{Area}=2\sqrt{96\times18\times72\times6}=2\times4\times6\times2\times18=1728 \text{ sq. rds.}$$

Solved by Professor *Scheffer*. An excellent trigonometrical solution was also received from *W. L. Harvey*, Portland, Maine.

PROBLEMS.

14. **Proposed by SYLVESTER ROBINS, North Branch Depot, New Jersey.**

In copying the following example, the class lost the coefficient of x in the equation:

$$\sqrt{x}+\sqrt[3]{y}=x\ldots.(1).$$

$$\sqrt{x^3}+\sqrt[3]{x^2}=(\ \ )x\ldots.(2),$$

and then set themselves to finding coefficients for the vacancy, which would allow rational values to x and y.

15. **Proposed by SETH PRATT, C. E., Assyria, Michigan.**

From a point in an equilateral triangle, the distances to the angles are, respectively, 20, 28, and 31 rods. Required a side of the triangle.

16. **Proposed by COLMAN BANCROFT, Professor of Mathematics, Hiram College, Hiram, Ohio.**

A traveller whose speed constantly increases in a geometrical progression passes A at 2 o'clock, B at 3:30, C at 4:30, and D at 6:18. At B he is moving at the rate of 12 miles per hour, and at C 18 miles. Find his rate at A and D, and the distance from A to each of the points B, C, and D.

17. **Proposed by G. B. M. ZERR. A. M., Principal of Schools, Staunton, Virginia.**

A sum of P dollars is loaned at r per cent. interest. At the end of the first year a payment of x dollars is made; and at the end of each following year the payment is made greater by m per cent. than the preceding year. If the sum is paid in n payments, find x.

18. **Proposed by WILLIAM E. HEAL, Member of the London Mathematical Society, Marion, Indiana.**

Two railroad trains, lengths m and n, meet at a siding, length l. How shall the trains pass if $l<m<n$?

Solutions to these problems should be received on or before May 1st.

GEOMETRY.

Conducted by B. F. FINKEL, Kidder, Missouri. All contributions to this department should be sent to him.

SOLUTIONS TO PROBLEMS.

2. Show that $\frac{1}{2}\pi=\left[\frac{2.\ 4.\ 6.\ 8.\ 10}{1.\ 3.\ 5.\ 7.\ 9}\ldots.\right]^{\frac{2}{\infty}}$, *Wallis's* expression for π.

II. Solution by P. H. PHILBRICK, C. E., Lake Charles, Louisiana.

The above expression as we will see is not correct.

We have from Trigonometry $\sin x = x\left(1-\frac{x^2}{1.2.3}+\frac{x^4}{1.2.3.4.5}-\text{etc.}\right)$.

To resolve the terms in the parenthesis into factors, we observe that they must be of the form $1-\frac{x^2}{q}$, since the coefficint of $x^0$is 1,and the exponents differ by 2.

Moreover, they must be such as to reduce the second member to zero for $x=\pm n\pi$, or $x^2=n^2\pi^2$, for such values of x reduce the first member to zero. Hence, $q=n^2\pi^2$. Making n successively 1, 2, 3, etc. the above becomes:

$$\sin x = x\left(1-\frac{x^2}{1^2\pi^2}\right)\left(1-\frac{x^2}{2^2\pi^2}\right)\left(1-\frac{x^2}{3^2\pi^2}\right)\ldots.$$

Putting $x=\frac{\pi}{2}$ we have,

$$\sin\frac{\pi}{2}=1=\frac{\pi}{2}\left(1-\frac{1}{2^2}\right)\left(1-\frac{1}{4^2}\right)\left(1-\frac{1}{6^2}\right)\ldots.$$

$$=\frac{\pi}{2}\left(\frac{2^2-1}{2^2}\right)\left(\frac{4^2-1}{4^2}\right)\left(\frac{6^2-1}{6^2}\right)\ldots.$$

$$=\frac{\pi}{2}\cdot\frac{2-1}{2}\cdot\frac{2+1}{2}\cdot\frac{4-1}{4}\cdot\frac{4+1}{4}\cdot\frac{6-1}{6}\cdot\frac{6+1}{6}\ldots.$$

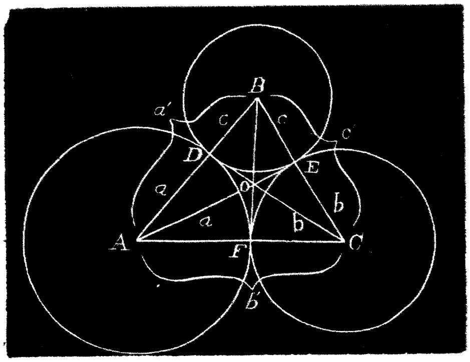
Therefore $\frac{\pi}{2}=\left(\frac{2}{1}\cdot\frac{2}{3}\right)\left(\frac{4}{3}\cdot\frac{4}{5}\right)\left(\frac{6}{5}\cdot\frac{6}{7}\right)\ldots.$

$$=\left[\frac{2.\ 4.\ 6.\ 8.\ldots.2n}{1.\ 3.\ 5.\ 7.\ldots.2n-1}\right]^2\frac{1}{2n+1},\text{ or}$$

$$=\left[\frac{2.\ 4.\ 6.\ 8.\ldots.(2n)}{1.\ 3.\ 5.\ 7.\ldots.(2n+1)}\right]^2\frac{2n+1}{1}.$$

4. Three circles whose radii are a, b, and c touch each other externally; prove that the tangents at the points of contact meet in a point whose distance from any one of them is $\left[\frac{abc}{a+b+c}\right]^{\frac{1}{2}}$. [Selected from *Todhunter's Plane Trigonometry.*]

I. Solution by Professor G. B. M. ZERR, A. M., Principal of Schools, Staunton, Virginia.



Let $OD=OE=OF=r$. Then $\frac{r}{2}(a'+b'+c')=r(a+b+c)=\triangle$ where $\triangle$ = area of triangle; but $\triangle=\sqrt{\tfrac{1}{2}(a'+b'+c')\tfrac{1}{2}(a'+b'-c')\tfrac{1}{2}(a'+c'-b')\tfrac{1}{2}(b'+c'-a')}=\sqrt{(a+b+c)abc}$. $\therefore$ $r(a+b+c)=\sqrt{(a+b+c)\,abc}$.

$$\therefore r=\left(\frac{abc}{a+b+c}\right)^{\frac{1}{2}}.$$

This problem was solved in a very excellent manner by *P. S. Berg, H. C. Whitaker*, and *P. H. Philbrick*.